10/069,460

WEST Search History

DATE: Saturday, July 12, 2003

Set Name side by side	Query	Hit Count	Set Name result set
	DB=JPAB,EPAB,DWPI; PLUR=YES; OP=ADJ		
L48	L46 and (jet or inkjet or ink-jet)	68	L48
L47	L46 and ((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo))	0	L47
L46	(skin or body or nail or hair) near2 (coloring or coloration or design or decorat$3 or make up or making up)	8103	L46
L45	L44 not l43	11	L45
L44	((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo)) and (body or skin or nail or hair) same (color$3 or design or decorat$3 or make up or making up)	16	L44
L43	((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo)) same (body or skin or nail or hair) same (color$3 or design or decorat$3 or make up or making up)	5	L43
	DB=PGPB; PLUR=YES; OP=ADJ		
L42	L41 not l36 not l34	9	L42
L41	L40 and l35	11	L41
L40	(((347/$)!.CCLS.))	3412	L40
L39	L38 and ((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo))	1	L39
L38	(424/401)!.CCLS. or 424/63.ccls. or 424/64.ccls. or 424/59.ccls. or 424/70.1.ccls. or 424/70.6.ccls. or 424/61.ccls. or 424/47.ccls. or 132/$.CCLS.	1412	L38
L37	l36 not l34	6	L37
L36	L35 and ((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo))	7	L36
L35	(skin or body or nail or hair) near2 (coloring or coloration or design or decorat$3 or make up or making up)	2036	L35
L34	((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo)) same (body or skin or nail or hair) same (color$3 or design or decorat$3 or make up or making up)	10	L34
	DB=USPT; PLUR=YES; OP=ADJ		
L33	L32 not l9 not l16 not l30	39	L33
L32	l31 and l17	66	L32
L31	((347/$)!.CCLS.)	24457	L31
L30	L29 and ((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo))	5	L30
L29	((132/$)!.CCLS.)	17263	L29

L28	L27 and ((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo))	0	L28
L27	(((424/47)!.CCLS.))	1254	L27
L26	L25 and ((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo))	0	L26
L25	(((424/70.6)!.CCLS.))	171	L25
L24	L23 and ((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo))	0	L24
L23	((424/61)!.CCLS.)	649	L23
L22	L20 and (jet or inkjet or ink-jet)	147	L22
L21	L20 and ((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo))	0	L21
L20	(424/401)!.CCLS. or 424/63.ccls. or 424/64.ccls. or 424/59.ccls. or 424/70.1.ccls.	6391	L20
L19	L18 not l9	33	L19
L18	L17 and ((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo))	42	L18
L17	(skin or body or nail or hair) near2 (coloring or coloration or design or decorat$3 or make up or making up)	13034	L17
L16	L15 not l9	79	L16
L15	L14 and ((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo))	89	L15
L14	(skin or body or nail or hair) near2 (color$3 or design or decorat$3 or make up or making up)	21365	L14
L13	L12 not l7	0	L13
L12	L11 and ((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo))	5	L12
L11	(skin or body or nail or hair) near2 (decorat$3)	1525	L11
L10	L9 not l7	1	L10
L9	((jet or inkjet or ink-jet) near3 (thermal or piezoelectric or piezo)) same (body or skin or nail or hair) same (color$3 or design or decorat$3 or make up or making up)	91	L9
L8	l7 and cosmetic	0	L8
L7	((jet or inkjet or ink-jet) near3 (thermal or piezoelectric)) same (body or skin or nail or hair) same (color$3 or design or decorat$3 or make up or making up)	90	L7
L6	((jet or inkjet) near3 (thermal or piezoelectric)) same (body or skin or nail or hair) same (color$3 or design or decorat$3 or make up or making up)	90	L6
L5	l4 and cosmetic	59	L5
L4	(jet or inkjet) same (body or skin or hair) same (color$3 or design or decorat$3 or make up or making up)	1296	L4
L3	l2 and cosmetic	104	L3
L2	(jet or inkjet) same (body or skin or hair) same (color$3 or design or treat$4 or decorat$3 or make up or making up)	2048	L2

L1	(jet or inkjet) same (body or skin or hair)	15153	L1

END OF SEARCH HISTORY

10/069,460

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* * * * * * * * * *   Welcome to STN International   * * * * * * * * * *

 NEWS  1           Web Page URLs for STN Seminar Schedule - N. America
 NEWS  2           "Ask CAS" for self-help around the clock
 NEWS  3  Feb 24   PCTGEN now available on STN
 NEWS  4  Feb 24   TEMA now available on STN
 NEWS  5  Feb 26   NTIS now allows simultaneous left and right truncation
 NEWS  6  Feb 26   PCTFULL now contains images
 NEWS  7  Mar 04   SDI PACKAGE for monthly delivery of multifile SDI results
 NEWS  8  Mar 24   PATDPAFULL now available on STN
 NEWS  9  Mar 24   Additional information for trade-named substances without
                   structures available in REGISTRY
 NEWS 10  Apr 11   Display formats in DGENE enhanced
 NEWS 11  Apr 14   MEDLINE Reload
 NEWS 12  Apr 17   Polymer searching in REGISTRY enhanced
 NEWS 13  Jun 13   Indexing from 1947 to 1956 added to records in CA/CAPLUS
 NEWS 14  Apr 21   New current-awareness alert (SDI) frequency in
                   WPIDS/WPINDEX/WPIX
 NEWS 15  Apr 28   RDISCLOSURE now available on STN
 NEWS 16  May 05   Pharmacokinetic information and systematic chemical names
                   added to PHAR
 NEWS 17  May 15   MEDLINE file segment of TOXCENTER reloaded
 NEWS 18  May 15   Supporter information for ENCOMPPAT and ENCOMPLIT updated
 NEWS 19  May 19   Simultaneous left and right truncation added to WSCA
 NEWS 20  May 19   RAPRA enhanced with new search field, simultaneous left and
                   right truncation
 NEWS 21  Jun 06   Simultaneous left and right truncation added to CBNB
 NEWS 22  Jun 06   PASCAL enhanced with additional data
 NEWS 23  Jun 20   2003 edition of the FSTA Thesaurus is now available
 NEWS 24  Jun 25   HSDB has been reloaded

 NEWS EXPRESS   April 4 CURRENT WINDOWS VERSION IS V6.01a, CURRENT
                MACINTOSH VERSION IS V6.0b(ENG) AND V6.0Jb(JP),
                AND CURRENT DISCOVER FILE IS DATED 01 APRIL 2003
 NEWS HOURS     STN Operating Hours Plus Help Desk Availability
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FILE 'HOME' ENTERED AT 14:52:41 ON 12 JUL 2003

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=> s (skin or body or nail or hair) (p) (coloring or coloration or design or decorating or decora
PROXIMITY OPERATOR LEVEL NOT CONSISTENT WITH
FIELD CODE - 'AND' OPERATOR ASSUMED 'HAIR) (P) '
L1       11070 (SKIN OR BODY OR NAIL OR HAIR) (P) (COLORING OR COLORATION OR
               DESIGN OR DECORATING OR DECORATION OR MAKE UP OR MAKING UP)

=> s l1 and ((jet or inkjet or ink-jet) (p) (thermal or piezoelectric or piezo))
PROXIMITY OPERATOR LEVEL NOT CONSISTENT WITH
FIELD CODE - 'AND' OPERATOR ASSUMED 'INK-JET) (P) '
L2           9 L1 AND ((JET OR INKJET OR INK-JET) (P) (THERMAL OR PIEZOELECTRIC
                OR PIEZO))

=> dup rem l2
DUPLICATE IS NOT AVAILABLE IN 'KOSMET'.
ANSWERS FROM THESE FILES WILL BE CONSIDERED UNIQUE
PROCESSING COMPLETED FOR L2
L3            9 DUP REM L2 (0 DUPLICATES REMOVED)

=> d l3 ibib kwic 1-9

L3   ANSWER 1 OF 9  CAPLUS  COPYRIGHT 2003 ACS
Full Text
ACCESSION NUMBER:         2002:409026  CAPLUS
DOCUMENT NUMBER:          137:8161
TITLE:                    Solid freeform fabrication of 3-D objects from porous
                          solid preform layers and pore-filling materials
INVENTOR(S):              Jang, Bor Z.; Ma, Erjian
PATENT ASSIGNEE(S):       USA
SOURCE:                   U.S. Pat. Appl. Publ., 17 pp.
                          CODEN: USXXCO
DOCUMENT TYPE:            Patent
LANGUAGE:                 English
FAMILY ACC. NUM. COUNT:   1
PATENT INFORMATION:

     PATENT NO.       KIND  DATE          APPLICATION NO.  DATE
     ---------------  ----  --------      ---------------  --------
     US 2002062909     A1   20020530      US 2000-726185   20001129
PRIORITY APPLN. INFO.:                 US 2000-726185      20001129
AB   A three-dimensional object is fabricated from porous solid preform layers
     and at least one pore-filling material including the following steps: (a)
     providing a work surface parallel to an X-Y plane of a Cartesian
     coordinate system; (b) feeding a first porous solid preform layer to the
     work surface; (c)dispensing a first pore-filling material onto the
     predetd. areas of the first preform layer to at least partially fill the
     pores of these areas forming the first section of the object; (d) feeding
     a second porous preform layer onto the first layer, dispensing a second
     pore-filling material onto predetd. areas of the second layer for forming
     the second section; (e) repeating the operations from (b) to (d) to stack
     up and build successive preform layers along the Z-direction for forming
     multiple layers of the object with the remaining un-hardened areas of
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individual layers staying as a support structure; (f) sequentially or simultaneously affix successive layers together to form a unitary **body**; and (g) removing the support structure by exposing the un-hardened areas of the unitary **body** to a support-collapsing environment, causing the 3-D object to appear. A CAD **design** of the 3-D object is created on a computer for automation of the dispensing app. The pore-filling material can be a thermosetting resin, a thermoplastic polymer, or a polymer-contg. soln. which harden upon curing, solidification, or solvent removal, resp. The preform layer can consist of a water-sol. material, or a material with a lower m.p. than that of the pore-filling material using water or high temp. as support-collapsing environment, resp. The dispensing app. can consist of an **inkjet** printhead, a gear pump, a pos. displacement pump, an air pump, a metering pump, an extrusion screw, a solenoid valve, and a **thermal** sprayer. The porous solid preform layers consist of a reinforcement compn., such as fibers, whiskers, spherical or ellipsoidal particles, flakes, platelets, ribbons, or disks.

L3 ANSWER 2 OF 9 CAPLUS
Full Text

ACCESSION NUMBER:	2000:276243 CAPLUS
DOCUMENT NUMBER:	132:336264
TITLE:	New inductively heated plasma source for reentry simulations
AUTHOR(S):	Herdrich, G.; Auweter-Kurtz, M.; Kurtz, H.
CORPORATE SOURCE:	University of Stuttgart, Stuttgart, D-70550, Germany
SOURCE:	Journal of Thermophysics and Heat Transfer (2000), 14(2), 244-249 CODEN: JTHTEO; ISSN: 0887-8722
PUBLISHER:	American Institute of Aeronautics and Astronautics
DOCUMENT TYPE:	Journal
LANGUAGE:	English
REFERENCE COUNT:	18 THERE ARE 18 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Magnetoplasmadynamic plasma generators (MPG), **thermal** arc **jet** devices and inductively heated plasma generators (IPG) have been developed for **thermal** protection system material tests at the Institut fur Raumfahrtsysteme. Because of the **design** of the IPG, no electrode erosion appears; plasma impurities are minimized. Hence, the behavior of gas components can be examd. individually and basic material tests (e.g., catalytic behavior) can be performed. The IPG3's induction coil is closer to the plasma than it was with previous designs, leading to a redn. of electromagnetic losses. The water cooling system surrounds the coil and the tube. IPG3 was qualified up to an anode power of 180 kW (argon), which is an improvement regarding the planned reentry simulations in combination with the MPG plasma wind tunnels (PWK). The structures of IPG3 and the facility PWK3 are presented. First exptl. results such as power characteristics are given. Frequency measurements were made, which will be a help for later numerical simulations of IPG3. A charge injection device camera was used to measure the radial intensity of the IPG3 plasma. The results led to a rough detn. of the **skin** depth.

ST magnetoplasmadynamic plasma generator reentry simulation; **thermal** arc **jet** device plasma generator

IT Jets
MHD (magnetohydrodynamics)
Plasma
Simulation and Modeling, physicochemical
(magnetoplasmadynamic plasma generators **thermal** arc **jet** devices and inductively heated plasma generators for reentry simulations)

L3 ANSWER 3 OF 9 CAPLUS
Full Text

ACCESSION NUMBER: 2001:749631 CAPLUS
DOCUMENT NUMBER: 136:21583
TITLE: Design and current status of development of a **jet** fuel **thermal** stability additive
AUTHOR(S): Taylor, Spencer E.
CORPORATE SOURCE: Fuels Technology Group, BP Amoco Oil, Sunbury-on-Thames, TW15 1DW, UK
SOURCE: International Symposium on Air Breathing Engines, Papers, 14th, Florence, Italy, Sept. 5-10, 1999 (1999), 431-440. Editor(s): Waltrup, Paul J. American Institute of Aeronautics and Astronautics: Reston, Va.
CODEN: 69BWFB
DOCUMENT TYPE: Conference; General Review; (computer optical disk)
LANGUAGE: English
REFERENCE COUNT: 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Design and current status of development of a **jet** fuel **thermal** stability additive

AB A review with refs. An initiative led by the US Air Force concluded that advances in military fighter aircraft systems would require fuels with over 50% improvement in heat sink capability over conventional JP8 fuel. This led to the creation of the "JP8+100" program during which hundreds of com. additives were tested for **thermal** stability enhancing characteristics. The **thermal** stability of **jet** fuels (particularly JP8) could be enhanced through the use of particular additives and additive blends used at relatively low concns. Addnl., flight testing highlighted a significant redn. in fuel-related maintenance costs, arising from cleaner combustion. One aspect of the incorporation of the most beneficial additives from a **thermal** stability viewpoint that has given some cause for concern, however, is the consequent effect on the water and solids sepn. from "JP8+100" fuel, a feature minimized by introduction of the "+100" additive as close to the **skin** of the aircraft as possible. Inspired by the USAF success, and anticipated consequential environmental benefits, we have conducted an exptl. program for the **design** and development of a conceptually new multifunctional mol. species to enhance the **thermal** stability of **jet** fuels, without compromising other required essentials of **jet** fuel product quality. The philosophy behind the additive development is described in the present paper, as are results and conclusions of lab. and large-scale tests conducted under this development program, which demonstrate (a) the activity of the new type of additive in enhancing the **thermal** stability of JP8 fuel, and (b) the compatibility of additive-contg. fuel with existing conventional filter/water sepn. systems.

ST review **jet** fuel **thermal** stabilizer

IT Heat stabilizers
  Jet aircraft fuel
   (design and current status of development of a **jet** fuel **thermal** stability additive)

L3 ANSWER 4 OF 9 CAPLUS COPYRIGHT 2003 ACS
Full Text
ACCESSION NUMBER: 1999:707393 CAPLUS
DOCUMENT NUMBER: 132:65333
TITLE: Developments in dyestuff chemistry
AUTHOR(S): Freeman, Harold S.; Sokolowska, Jolanta
CORPORATE SOURCE: North Carolina State University, Raleigh, NC, USA
SOURCE: Review of Progress in Coloration and Related Topics (1999), 29, 8-22
CODEN: RWPCAG; ISSN: 0557-9325
PUBLISHER: Society of Dyers and Colourists
DOCUMENT TYPE: Journal; General Review
LANGUAGE: English

REFERENCE COUNT: 135 THERE ARE 135 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB A review with 135 refs. mainly based on patent literature is given on recent developments in the **design** and synthesis of org. dyes and to use that information to anticipate future directions in this field. The following fields in dye research are surveyed: reactive and disperse dyes for textiles, liq. crystal dyes, **ink-jet** dyes, **thermal** and pressure-sensitive dyes, org. photoconductors and toners, and infra-red absorbing dyes. New technologies for colorant application to textiles as enzyme applications, use of supercrit. fluids, electrochem., and ultrasound are mentioned. Research activities regarding **hair**, biomedical, and other functional dyes are also considered. The use of sophisticated mol. modeling programs is described.

L3 ANSWER 5 OF 9 CAPLUS COPYRIGHT 2003 ACS
Full Text

ACCESSION NUMBER:	1999:81149 CAPLUS
DOCUMENT NUMBER:	130:126866
TITLE:	Computational investigation of the fluid-solid thermal interaction in a plate quench process
AUTHOR(S):	Craig, K. J.; De Kock, D. J.
CORPORATE SOURCE:	Department of Mechanical and Aeronautical Engineering, University of Pretoria, Pretoria, 0002, S. Afr.
SOURCE:	PVP (American Society of Mechanical Engineers) (1998), 377(Computational Technologies for Fluid/Thermal/Structural/Chemical Systems with Industrial Applications, Vol. 1), 69-78 CODEN: APVPDM; ISSN: 0277-027X
PUBLISHER:	American Society of Mechanical Engineers
DOCUMENT TYPE:	Journal
LANGUAGE:	English
REFERENCE COUNT:	15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB This paper describes the computational investigation of the fluid-solid **thermal** interaction of water with armored plate during a plate quench process. The paper addresses the quality of the quench process, and the control of the quench process. The techniques of Computational Fluid Dynamics (CFD) in the form of the com. CFD code, STAR-CD, are used. The quench process is modeled as a water-only process through the implementation of certain assumptions based on phys. obsd. behavior. Three-dimensional effects are captured in the quench **jet** velocity, plate temp. distribution and **skin** heat transfer coeffs. These are shown to be due to the supports in the quench header and could lead to buckling of the plate due to uneven heat transfer. The control of the process is illustrated by the successful application of Computational Flow Optimization (CFO) to the current problem. The process variables **jet** velocity and plate speed are used as **design** variables to automatically obtain a specified quench rate at a certain depth in the plate, thereby specifying the thickness of the hardened layer.

L3 ANSWER 6 OF 9 CAPLUS COPYRIGHT 2003 ACS
Full Text

ACCESSION NUMBER:	1997:786754 CAPLUS
DOCUMENT NUMBER:	128:94262
TITLE:	Effects of high frequency disruptions on the JET divertor cryopump, including potential JET toroidal field upgrades
AUTHOR(S):	Papastergiou, S.; Ageladarakis, P.
CORPORATE SOURCE:	JET Joint Undertaking, Abingdon, Oxon., OX14 3EA, UK
SOURCE:	Fusion Technology 1996, Proceedings of the Symposium on Fusion Technology, 19th, Lisbon, Sept. 16-20, 1996

(1997), Meeting Date 1996, Volume 1, 743-746.
Editor(s): Varandas, C.; Serra, F. Elsevier: Amsterdam, Neth.
CODEN: 65KYAT

DOCUMENT TYPE: Conference
LANGUAGE: English
REFERENCE COUNT: 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB The **JET** Divertor Cryopump System was designed several years ago and the **design** took account of **thermal** and eddy current stresses. The **design** calcns. were based on static analyses for disruptions with poloidal magnetic field variation of 110T/s and a toroidal magnetic field (TF) of 3.4T. The cryopump operated during the 1994-95 exptl. campaign without any failures. Subsequently detailed endoscope inspections indicated no distortion or damage in any of the cryopump areas. During this last exptl. campaign, a significant portion of plasma disruptions were of high value and relatively high frequency. The eddy current stresses are in principle proportional to both the velocity of the disruption and the TF. The cryopump system was able to withstand these severe disruptions and in order to explain this ability, an anal. has been performed to investigate the dynamic/impact nature of the load, together with the natural frequencies of the structure. In addn., the transient nature of eddy currents, the '**skin**' effect and the current decay time have been quantified. The calcns. indicated that, although any damping characteristics of the structure have no significant effect for these high value disruptions, the high stress areas of the pump have a natural frequency much smaller (~4%) than the frequency of the severe disruptions. Therefore, the dynamic effect of these impact loads is approx. 30% of an equiv. static load and resulted in no failure. These analyses confirmed the demonstrated and expected high reliability of the cryopump even for a possible upgrade of the TF to 4T.

L3 ANSWER 7 OF 9 CAPLUS COPYRIGHT 2003 ACS
Full Text

ACCESSION NUMBER: 1995:829683 CAPLUS
DOCUMENT NUMBER: 123:260572
TITLE: Mathematical models for heat pipes
AUTHOR(S): Colwell, Gene T.; Modlin, James M.
CORPORATE SOURCE: Georgia Institute Technology, School Mechanical Engineering, Atlanta, GA, 30332, USA
SOURCE: Advances in Heat Pipe Science and Technology, Proceedings of the International Heat Pipe Conference -- 8th, Beijing, Sept. 14-18, 1992 (1993), Meeting Date 1992, 89-93. Editor(s): Ma, Tongze. International Academic Publishers: Beijing, Peop. Rep. China.
CODEN: 61QQA7
DOCUMENT TYPE: Conference
LANGUAGE: English

AB Anal. models, finite difference models, and finite element models that are used in the **design**, system integration, and failure anal. are discussed. Effect of fins on heat pipe, effect of **body** forces on the capillary limit, adverse **body** force effect on the superheat, effect of boiling on the stagnation temp. of leading edge, vapor resistance correlation, **thermal** resistance, scram-**jet** transient surface stagnation temp. by using transpiration and film cooling, and comparison of leading edge temp.of test case and finite difference model are presented graphically.

L3 ANSWER 8 OF 9 CAPLUS COPYRIGHT 2003 ACS
Full Text

ACCESSION NUMBER: 1980:428413 CAPLUS
DOCUMENT NUMBER: 93:28413

TITLE: The prediction of surface discharge jets by a three-dimensional finite-difference model
AUTHOR(S): Raithby, G. D.; Schneider, G. E.
CORPORATE SOURCE: Dep. Mech. Eng., Univ. Waterloo, Waterloo, ON, N2L 3G1, Can.
SOURCE: Journal of Heat Transfer (1980), 102(1), 138-45
CODEN: JHTRAO; ISSN: 0022-1481
DOCUMENT TYPE: Journal
LANGUAGE: English

AB A 3-dimensional model is presented which describes the **thermal** and hydrodynamic behavior of a turbulent heated **jet** entering at the surface of a receiving **body** of water. A 2-equation turbulence model, together with a semiempirical description of the preferential attenuation of vertical turbulent exchange due to buoyancy, is used to predict nonisotropic turbulent diffusivities. A finite-difference soln. method, involving several novel features, was used. Predictions are compared with both field and lab. measurements, for both deep and shallow receiving basins, for the special case of a quiescent ambient fluid. Good agreement is found, indicating that the model can be reliably used as a **design** tool, or to evaluate the environmental impact of surface discharges.

L3 ANSWER 9 OF 9 CAPLUS COPYRIGHT 2003 ACS
Full Text
ACCESSION NUMBER: 1958:118778 CAPLUS
DOCUMENT NUMBER: 52:118778
ORIGINAL REFERENCE NO.: 52:21016i,21017a-g
TITLE: High-energy fuels for aviation
AUTHOR(S): Wells, R. A.
CORPORATE SOURCE: Gulf Research Develop. Co., Pittsburgh, PA
SOURCE: Journal of the American Society of Mechanical Engineers (1958), 80, 55-9
CODEN: JASEAX; ISSN: 0095-909X
DOCUMENT TYPE: Journal
LANGUAGE: Unavailable

AB Basic considerations in the selection of high-energy fuels for air-breathing engines and for rocket engines (which do not use air as their O source) are discussed. In a turbine engine, the hotter the combustion-gas temp., the more power the engine will produce, but the allowable turbine-wheel temp. limits the allowable gas temp., so that a fuel with higher B.t.u./lb. will have to be burned at a leaner fuel/air ratio. Military turbine engines operate on JP-4 fuel which is a relatively wide-cut petroleum fuel in both the gasoline and kerosine boiling range. The av. B.t.u./lb. for this fuel is 18,703; per gal. 119,885. A high-energy fuel for this application aims at 140,000 B.t.u. per gal. with at least 18,400 B.t.u. per lb. and an abundant supply. Unfortunately, with hydrocarbon fuels from petroleum, as the B.t.u. per gal. increases the B.t.u. per lb. decreases. As planes and missiles fly faster, the fuel tanks are exposed to higher temps.; at slightly above Mach 2, the **skin** temp. (fuel-tank side) of an aircraft at 70,000 ft. is 300°F. Aircraft engines depend on the fuel in the tanks to take away the heat from their lubricating oil. These two sources of heat adversely affect the fuel's deposit-forming properties. Attempts to increase **thermal** stability have led to the use of JP-6, a special cut and more thermally stable petroleum fuel with less severe f.-p. requirements, but this fuel is not expected to **make up** a large part of military requirements. Alkylated derivs. of basic polycyclic hydrocarbon structures will be investigated. The use of aromatic hydrocarbons causes severe combustion problems; satd. hydrocarbons also have considerably higher heating values per lb. than do corresponding aromatic hydrocarbons. Pyrophoric fuels show promise for long-range-weapon systems. These fuels ignite spontaneously in air. Weapon systems with pyrophoric fuels can fly faster at higher altitudes with leaner mixts. and virtually eliminate

flameout. These pyrophoric fuels are also desirable as a fuel addn. in the combustion chambers of turbo-**jet** engines. Pyrophoric fuels are organometallic compds. Three have been prominent: TEA (triethyl aluminum), TEB (triethyl borane), and TMA (trimethyl aluminum). Recently TBB (tributyl borane) has been found to have very high flame speeds; it must be sprayed before it exhibits its pyrophoric characteristics. TEA ignites spontaneously with air and is said to be hypergolic with liquid O in both gaseous and liquid phases. It reacts violently with active H compds. such as alcs., acids, amines, mercaptans, etc. and also with halides, and must be kept in a dry and inert atm. TEA and TEB are extremely destructive to living tissue and can cause deep **skin** burns. Special handling must be used to avoid fires. Of these compds. TEB and TBB appear to be most suitable for high Mach aircraft, but poor lubricity may give pumping problems. Little unclassified information is available on the new B-CH fuels, but more is available on the B hydrides which closely resemble these. The high heating values of the B hydrides are attended by extreme reactivity, which is a real advantage if it can be controlled within a **jet** engine, as it results in more complete combustion and absence of blowout. B2O3 deposits are a real problem in a turbine engine burning B-C-H fuels, but are not as important for after-burners or ramjets. Vapors from B hydrides are extremely toxic, explosive in air, and react with water; the new B fuels apparently have lower vapor pressures and hence less tendency to form explosive or toxic concns. The B2O3 formed on burning B compds. leaves a dense cloud which covers a wide area, possibly interfering with military operations, plant life, etc. High-energy fuels are expensive and are probably justified only for specific military uses. Rockets are briefly discussed; these use an oxidizer and a fuel. Of the various oxidizers, liquid O is the most available, cheapest, and probably the least hazardous.

=>